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"Intelligent" Buying

One of the "best sellers" of the last few decades has been Mr. G. B. Shaw's "The Intelligent Woman's Guide to Socialism." With all deference to the author's eminence in the world of literature, we suggest that a high percentage of sales was ascribable to the flattery which the title confers upon the potential reader. Conversely, we would strongly advise any newly appointed executive to refrain from designating a hefty labourer "unintelligent," unless he is prepared instantly to resort to fisticuffs with a reasonable chance of success.

Thus these words "intelligent" and "unintelligent" rank high in the order of importance of the psychological repercussions, and it was with profound interest that we learnt that the American Foundrymen's Association have made good use of the former word in a recently issued *quasi*-specification, the title of which is "Recommendations to Buyers of Castings (Data Required for Intelligent Estimation of Casting Costs)." Much of the co-operation sought is obtained from the issue of a printed form headed "Request for Casting Quotation," which gives information under the following headings:—Material Specification No.; Per Blue Print of Part No. Attached; Weight each ..... lbs. Actual (Estimated); Please Quote Price per Each in Quantities of ....., ..., ..., f.o.b.....for Delivery by ....., *Pattern Type;* Pattern is Designed for Castings to be Made of .....and Patternmaker's Shrink of ....inch per foot was Used in its Construction; ..... Loose, not gated suitable (not suitable) for Mounting on Plate; Loose, Gated, with ..... Units per Gate; Approximate Overall Size .....; ..... Wood, on Board, with Units per Board; for Flask Size.....; Match Plate, with ..... Units per Plate for Flask Size; ..... Cope and Drag, with ..... Units on Board, for Flask Size ..... The Patterns Mounted on Plates or Boards can (cannot) be Readily Removed or Remounted; Pattern Material: Pine, Mahogany, Aluminium or ..... New (Old) has Run Approximately ..... Moulds. It will readily be agreed that this gives a very comprehensive story as to the actual pattern. Space is provided for dealing with five different cores, and against each the following information is elicited:—Cores per Casting; Material of Boxes; Number of Boxes; Cores per Box; Designed for Blower; Material of Dryers; Number of Dryers. A space is provided for the "Total Cores per Casting," followed by "No Pattern is Available." The final section asks a number of questions of a very interesting character. Amongst these are:—Please Quote in Supplying Temporary (Production) Equipment for Approximately ..... Pieces; Flasks; Quantity .....; Type; Make .....; Size .....; Construction; Approximate Annual Requirement ..... Pieces; Approximate Quantity per Order ..... Pieces. These quantities are estimates for general guidance only. They may be changed without notice. Radiographic (Magnaflux) inspection by foundry is (is not) required for sample only (random castings) (all castings). The last few lines are devoted to previous difficulties, and information is asked as to their nature and location, plus one line for remarks. This will enable the buyer to give such information as to whether the casting is to be surface processed.

The general use of such a form throughout the British foundry industry would save innumerable telephone calls and letters, and, what is more important, accelerate delivery, reduce scrap and give help in the direction of foundry output planning. If, as we suggest it should, the British foundry industry were to emulate American enterprise, then we believe it would be advisable to adopt the Shavian trick of calling any document issued "The Intelligent Buyers' Guide to the Purchase of Castings." The preparation of a form appropriate to British conditions is obviously the work for a committee, in order to align it with the diversities encountered in our national business conditions.

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CORRESPONDENCE

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

CUPOLA OPERATION AND CONTROL

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—I have been reading the article on "Cupola Operation and Control," by Mr. R. C. Tucker, in the February 17 issue of THE FOUNDRY TRADE JOURNAL. It seems to me that in Table I, on page 136, there is an error. The volumes of air corresponding to the different cupola diameters given as cub. ft. per hr. should surely be cub. ft. per min.; also, in Table III, on page 137, I think the first of the three temperatures given over the column headings should be 1,230 deg. C. instead of 1,400 deg. C. Then, coming to Table V, on page 138, it should be pointed out that the melting rate in tons per hr. refers to American short tons of 2,000 lbs.

Yours, etc.,

J. L. FRANCIS.

Foundry Services, Limited, Long Acre,
Nechells, Birmingham, 7.
February 21, 1944.

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—I have investigated Mr. Francis' corrections, and find:—

(1) Table I, page 136, should be cub. ft. per min. and lbs. dry air per min.

(2) Table III, page 137, the temperatures given are correct.

(3) American short tons are implied, as the reference is to "The Iron Age," an American journal. I rather think that if J. Reese's Paper is consulted the error will be found to have occurred in the original and been missed by me in copying. I am afraid I have sent my copy back to the library.

Hoping this will answer Mr. Francis' criticisms satisfactorily.

Yours, etc.,

R. C. TUCKER.

Newton, Chambers & Company, Limited,
Thorncliffe, near Sheffield.
March 1, 1944.

CAST DIES FOR FORGING SHELLS

A recent issue of "Metals and Alloys" contains an article by Mr. P. Attenborough, a member of the London Branch of the Institute of British Foundrymen, which is of considerable interest to manufacturers of high-duty irons. His Table I shows that an examination of the results obtained with Meehanite cast dies for forging shells in 13 different installations a distinctly better performance was given than when using expensive Ni-Cr-Mo air-hardening steel. The actual average figures were 18,000 for Meehanite and 11,000 for the special steel.

BOOK REVIEW

Modern Foundry Practice. Edited by E. D. Howard, with an Introduction by V. C. Faulkner, Editor of THE FOUNDRY TRADE JOURNAL. Published by Odhams Press, Limited, 24, Henrietta Street, London, W.C.2. Price 8s. 6d.

The appearance of this book is particularly opportune, as the foundry industry is now attracting to its ranks large numbers of students and trainees, and it is from this angle that the book has been compiled.

For the reviewer, as a director of a general jobbing foundry, the book has maintained its interest from cover to cover, and especially were the well-planned chapters on this section of the industry appreciated. The illustrations are particularly easy to follow in practice, while the hints on patternmaking, facing sands, coremaking, moulding and fettling are well worth trying out.

The founding of metals, covering a wide range of alloys, embracing steel, cast and malleable irons, heavy and light non-ferrous, is of particular interest in view of the rapid strides registered since the last war. The difficult problem of taking the student from the most elementary stages to explanations of microstructure as changed by heat-treatment or effected by thermal history is not easy of solution, yet this has been splendidly accomplished. A combination of clarity and conciseness makes the subject easy to assimilate. Melting furnaces of many types are both well described and illustrated, and this remark also applies to the section devoted to moulding machines.

Mechanisation is dealt with quite separately, and makes the reviewer wonder whether it represents a pre-view of still greater expansion in the future, and its effect on the jobbing foundry. The level of the technical accuracy of the book is high, as would be expected from authors of such eminence in the industry. The very modest cost of the book places it within the reach of all interested in foundry practice. It is so well indexed, carrying something of the order of 600 entries, that its value as a work of reference is great, while it can be recommended as a text-book.

C. C.

PUBLICATION RECEIVED

Steel Horizons. The Christmas number of the house organ of the Allegheny Ludlam Steel Corporation is an outstanding example of the use of colour printing for illustration. The principal article is on electronics in industry, which describes and illustrates some work done by the Radio Corporation of America. A second article discusses recent advances made by Edison Industries, while others cover army canteen equipment and cutting tools.

An Apology.—We regret that owing to a misprint we gave the author of the article on "Producing Sound Magnesium Castings" as J. Haywood instead of J. Hayward.

STEEL MELTING PRACTICE*

A critical review of the melting practices used in Melbourne steel castings

By J. PRESTON

The steelfoundry in Victoria owes its existence chiefly to the demands of the mining industry for something better than the cast iron of 30 years ago, but has now established itself as an important manufacturing industry. Victorian steelfoundries send their products all over Australia, to New Zealand, New Guinea, Fiji, India, and Malaya, and have shown great courage and initiative in tackling the production of a multiplicity of types of castings in many varied grades of steel.

In Melbourne steel is melted from steel scrap which, of course, is rusted or oxidised. Unfortunately, there is no commercial method whereby steel can be melted without making contact with the air and thus absorbing oxygen. Oxygen combines readily with iron to form iron oxide, and the presence of iron oxide in molten steel makes it "wild," and if such metal were poured into sand moulds, the resulting castings would be a spongy mass of blow-holes. Steel is more critical than any metal as regards relationship between physical properties and chemical composition, for as little as 0.1 per cent. of carbon, phosphorus, or sulphur will create great differences in physical properties, and even silicon and manganese must be carefully controlled. A typical soft foundry steel has the following analyses:—C, 0.2; Si, 0.3; Mn, 0.7; P, 0.05; S, 0.05; iron, 98.7 per cent. Relatively speaking, it is fairly pure metal.

In Melbourne the crucible furnace, the side-blown converter, a modification of the Bessemer process, and the electric furnace lined with either acid or basic refractories are all used.

Crucible Process

The metal to be melted is placed in the crucible, which is put in the furnace and heated by coke, oil, gas, or even electricity. It is not possible to produce commercially low carbon steels by this method, as the molten iron absorbs carbon from the crucible and becomes very hard. Melting steel in clay or aloxite crucibles which contain no carbon is not a commercial proposition in the modern foundry, and therefore most castings in crucible steel vary from 1 per cent. to 1.5 per cent. C, and have to be annealed slowly to make them soft and tough. The crucible is purely a melting process, and is ideal for producing small quantities of liquid steel.

If the metals charged into the crucible are carefully weighed and, when melted, protected from contact with the air, furnace gases, and pieces of coke, except for carbon pick-up, the composition will be exactly as calculated, and a melting loss of no more than 1 per cent. need be obtained. To protect the metal, 1 lb. or so of clean silica sand will make an ideal slag cover; if need be, a sprinkle of lime can be mixed with it to flux it.

Crucibles are still used for melting various expensive alloy steels, which usually are only required in comparatively small quantities, also for melting alloys like ferro-manganese for mixing with converter steel in the ladle.

Converter Practice

The bulk of the local steel castings are made in converters, a process which has undeservedly lost favour overseas, particularly in America. Making good converter steel demands first-class equipment, good refractories, and skilled operators, but offers many advantages. First, it is very fluid and can be held in the ladle for an hour or more so that several blows can be poured into the one job. Then there is its flexibility of operation. Usually it is operated on alternate afternoons, when it produces up to 16 or more heats, delivering liquid steel every 20 min.

A typical converter installation will consist of a converter of capacity 30 to 40 cwts., a cupola lined to about 38 to 40 in. dia.; a transfer crane and ladle. The cupola blower will need to deliver about 3,000 cub. ft. of air per min., and the converter about 4,000 to 4,500 at a pressure of 3 to 4 lbs. per sq. in. Possibly the refractories in the converter have to withstand the severest service in the industry. The temperature rises to as high as 1,700 deg. C., then iron oxide, which is formed continuously, fluxes the lining; moreover, there is the mechanical abrasion of the churning slag and metal.

For efficient converter operation there are several important factors:—(1) The shape and size of the vessel and bottom must be maintained as constant as possible; (2) the angle of the tuyeres to the bath must be carefully set and maintained; and (3) the composition of the molten metal from the cupola charged to the converter must be carefully controlled to set limits. More so than any furnace, every converter has its peculiarities which have got to be studied, diagnosed, and carefully remedied. The converter can play some very spectacular tricks—a violent explosive boil will hurl slag and metal from the converter and set fire to everything and everybody in a 100-ft. radius.

Lining Converters

There is a considerable difference in methods of lining converters in Melbourne. Some foundries ram up their linings with a type of artificial ganister they make up in a chilean mill. The basis of this material is clean silica or quartz gravel mixed with a bonding agent either Kaolin or fireclay and water. Sometimes clean used silica brick-ends and crushed graphite crucibles are mixed into the ganister. In most foundries the exact nature of these mixtures and the exact methods of preparing them are jealously guarded fur-

* A Paper read before the Institute of Australian Foundrymen. The author is Metallurgist to the Chass. Ruwolt Pty. Ltd.

Steel Melting Practice

naceman's secrets. The ideal ganister would appear to be a mixture containing as much highly refractory matter like silica and graphite as possible bonded with just sufficient clay to hold it in position until the heat can sinter it into a solid mass. Many furnacemen, however, like a ganister which is strongly bonded. Care must be taken to see the ganister contains only sufficient clay to hold it in position and to act as a mild flux to enable the silica particles which give the mixture its heat-resisting properties to weld into a solid mass. Ganister, newly mixed, requires to be "seasoned" for a few days in a bin before use. At first sight this seems fallacious, but it is a world-wide custom, and results justify it.

The other method is to line the converter, usually with a layer of firebricks, and then one or more layers of silica bricks or blocks. This method calls for very careful bricklaying technique, as the bricks are actually locked in the steel shell, and in making the joints a careful balance must be struck. The bricks will expand in heating up to 2 per cent., and allowance must be made for this expansion; but, on the other hand, the joints must be tight enough for the first heat to prevent the internal pressure in the converter blowing metal through the joints to the shell. It has been found that all silica brick lining trouble arises either from tight joints which crush bricks by expansion pressure, or sloppy, uneven joints which let air and metal through.

In the surface blown type of converter, and using a brick lining, the tuyeres are made by laying bricks carrying a hole about 1¼ in. dia. running lengthways through their centre. Founders who ram their linings insert pipes as patterns for their tuyeres, ram well around them, and then withdraw them. The shape of the bottom varies in different shops—some use a flat cylindrical bottom, others a hemisphere. It is vital, however, that whatever shape gives the best results with a particular converter must be maintained. The converter must be heated to a red heat with a coke fire before any metal is charged. The liquid metal charged to the converter is melted in the adjacent cupola and tapped into the transfer ladle.

Cupola Practice

Cupola practice in the steelfoundry is somewhat different from iron-shop procedure. First, higher temperatures are required to melt steel scrap, and there is more oxide present in the charge, giving a greater attack on the lining. A coke ratio of 5 to 1, including bed, is very good practice, using miscellaneous scrap and, of course, more limestone will be required to keep the slag running freely. A 38-in. dia. cupola melts just under 6 tons per hr., using an 80 per cent. steel charge. The metal is tapped at a temperature of 1,450 to 1,500 deg. C., which is very hot for cupola melting.

Usually the steelfoundries charge about 70 per cent. purchased steel scrap, 20 per cent. shop returns, that is, steel risers, runners, etc., and 10 per cent. pig-iron. Ferro-silicon and ferro-manganese may be added. This melts down in the cupola to a hard white iron about 2.2 per cent. carbon, 1.2 per cent. silicon, 0.6 per cent. manganese, and phosphorus and sulphur must be kept as low as possible. The carbon pick-up during melting will vary with the height of the bed and speed of melting, but if the grade of scrap, size and weight of coke, and diameter of the cupola are kept constant and air pressure and volume controlled, a cupola will function like clockwork, giving a constant grade of metal at a high temperature.

Conduct of the Process

The liquid iron is charged to the converter, and the vessel is stood up until the metal is just about to enter the tuyeres. The tuyeres should be at an angle of about 10 to 20 deg. to the surface of the metal. The tuyere box is sealed and the blast turned on. For about 3 min. nothing much appears to happen: sparks and slag particles are ejected with brown fumes of iron oxide. The metal in the bottom is circulating under the impact of the high velocity air, and gradually the bath becomes impregnated with iron oxide. A clean flame appears at the mouth of the converter called the "light" or "flame." This will burn steadily for 4 or 5 min., then suddenly mounts in size and luminosity, indicating the "boil" period. The metal has now warmed up, the silicon, manganese, and any free carbon are burning off rapidly, the slag volume increased due to the oxidation products and fluxing of the lining, and the metal and slag are heaving and bubbling with burning gases. This is the period when slag and metal may be ejected from the vessel and must be carefully handled. Usually the air pressure is reduced and the vessel turned back a degree or two to keep the tuyeres on the surface of the metal which has shrunk in volume due to oxidation losses. A sickly orange-yellow flame at this stage indicates danger of an ejection of the molten mass.

After the boil the flame drops away for a minute or so, then mounts in size and intensity as the carbon begins to oxidise. In some shops the practice is to add lump ferro-silicon to the vessel just after the boil to keep a source of heat present to prolong the carbon oxidation and produce hotter finished metal. In Belgium, it is said, silicon is added after the normal blow is finished, thereby producing a super-heating boil for pouring very thin section work. The iron oxide is reduced by the iron carbide present, and carbon monoxide is formed which burns to carbon dioxide at the mouth of the vessel. The flame mounts to a maximum, then loses size and luminosity, and brown fumes of iron burning will appear. The blow is over and the converter now contains a bath of oxidised iron containing only a trace of C, Si and Mn, and about 0.05 per cent. P and S at a temperature of 1,650 to 1,700 deg. C.

This metal is "wild" and useless as such, but it can be deoxidised or reduced by adding ferro-manganese, which is thrown into the vessel in wet lumps—wet to explode the slag and enter the metal. If there

be an excess of iron oxide, indicating that the heat is over-blown, the addition of the manganese will cause violent bubbling and a bright yellow flame. As in all steel furnaces, the nature and volume of slag tell the operator what is happening in the furnace. An over-oxidised heat carries a watery slag which cools to a shiny, frothy, black mass, whereas a good slag cools to a more solid dull black. The volume of slag also indicates the extent to which the lining is being attacked. The operator should study his slags and endeavour to co-relate changes in their appearance with the character of the heat.

Finishing and Casting

In personal practice, a skimmer is fitted to the nose of the horizontal converter and the metal is poured. Ferro-silicon, aluminium, calcium silicide, and ferro-titanium may be added to the ladle as deoxidisers. If nickel or chrome steel is made, these alloys are thrown into the stream when pouring, and any desired carbon increase can be obtained by adding a quantity of liquid cupola metal either to the ladle or the converter. In some foundries when, say, an 0.8 per cent. carbon steel is required, rather than blow down to zero and recarburise, they stop the blow at a certain point and add their finishing alloys. This is very skilful, but involves an element of doubt at the best of times and seems an unnecessary risk when molten iron of known composition is available for recarburising.

Nickel, chrome, and molybdenum steel can all be made satisfactorily by adding these alloys to the stream during pouring. Some idea of the great fluidity of converter steel can be gained by the fact that in making certain alloys over 1 cwt. of stone-cold metal is added to about 30 cwts. of converter steel without making it too dull to handle, although it is better practice to preheat the alloy additions.

A Warning

The boil period is the danger time during a blow. If the vessel and metal from the cupola are dull, the slag is pasty and tends to entrap the air. It would appear that air is trapped in the vessel under the slag and held until the pressure builds up and possibly until enough CO and air are present to form an explosive mixture. Slag and metal will be ejected from the converter and often great damage done to the lining. There is reason to believe that wrong angle, dull metal, refractories falling into the bath, bottom losing shape, and too high an air pressure will create conditions causing an explosion. Other common blowing faults are tuyeres "nosing" or closing up, and failure to get the "flame" or "light." If the metal begins to freeze around the tuyeres, the vessel must be turned horizontal and the tuyere cover removed and the holes cleaned with a pointed bar. The vessel must be reset so that the metal is level with the bottom of the tuyeres, and perhaps ferro-silicon added to increase fluidity. This must be carried out as rapidly as possible, suitable tools for clearing the tuyeres being kept handy for instant use. Failure to start the reaction may be due to tuyeres blocked, wrong angle setting, bad shape, cupola metal too dull, and other causes. The reason must first be diagnosed and instantly corrected. Sometimes iron ore thrown into the vessel will set the reaction going.

When cupola and converter are operating efficiently, steel can be poured every 20 min. Customarily, the wind is put on at the cupola at a quarter to eleven. It is tapped about 30 min. later, and the first heat is in the converter 40 min. after the wind goes on at the cupola. As the first blow of the day averages 15 min., the first steel is down an hour of the wind going on at the cupola. Sixteen blows will be down by five o'clock, which is considered a fair day's work for the converter lining.

Electric-Furnace Practice

According to data collected by the Steel Founders' Society of America, of 267 steelfoundries in U.S.A., 175 were using electric furnaces, the most popular sizes being 1½ tons, 3 tons and 6 tons, the majority being acid lined. In Australia, the only drawback is that the electrodes have to be imported, and are rather expensive. Electric furnaces may be either acid or basic lined. The acid furnace is cheaper on power and refractories and much faster on production. Charging cold scrap to a 1-ton furnace, a 25-cwt. heat is tapped every 2 hrs. for a power consumption of 750 units, which is 600 units per ton. The acid furnace is lined with silica bricks, the roof is made of firebricks, and the all-important hearth is built up of silica bricks and ganister.

For efficient melting it is essential to keep the hearth true to size and shape. The tendency is always for the metal to cut in to the hearth and undermine the walls. After a heat is poured, the bottom must be cleaned of slag and any holes filled with clean silica sand. Quite big holes in the bottom and banks of the furnace can be repaired in this way if the holes are cleaned of slag immediately after pouring, and clean sand put in, and then a steel plate thrown over to protect the patch from being injured by the next charge of scrap, a good bottom can be kept in repair whilst hot.

As there is no reduction of P and S in the acid furnace, clean mild-steel scrap is the best charge. The furnace can be charged by hand with good scrap in 10 min. and the power turned on.

A 1-ton furnace melting 25 cwts. of mild steel melts down under a load of 120 volts, with 2,500 amps. on each electrode in about 1½ hrs. The melting down can be speeded up by judiciously poking unmelted scrap into the pool of metal that forms under the electrodes, but this can be overdone and skulls formed which will delay the heat. Some melters have a tendency to fidget with the furnace during the melt down, constantly opening the doors, pushing the charge, and turning off the power to inspect the metal. Experience will teach the exact amount of "pushing in" a charge will require, and, except for putting a shovel of sand on, nothing further need be done.

Working an Acid Charge

The melter has, whilst following sound principles, got to evolve a technique to suit local conditions. If

Steel Melting Practice

clean mild-steel scrap is charged, it will melt down to about 0.20 per cent. C and 0.25 per cent. Mn. Neither ore nor coke will be necessary for ordinary soft steel, but if a dead low carbon bath is required, about 15 lbs. of ore per ton will give a vigorous boil which, however, must not be prolonged, as it will quickly attack the lining. An addition of ferro-silicon will stop it instantly. For making medium carbon steels a few pounds of coke dust in the charge will prove a satisfactory source of carbon. In America a high carbon iron called washed metal is added to deoxidise and recarburise.

When the charge is molten, it will be very gassy and contain iron oxide FeO and MnO in solution. These oxides will attack the siliceous lining of the furnace if sufficient clean sand is not added to satisfy them. Incidentally, most writers on the subject speak of adding a "few shovels of floor sand to the slag." This seems bad practice, as the average steelfoundry floor sand contains much iron oxide, and clean silica sand is cheap and plentiful. The first slag, when cold, will be a blackish colour, but after sand additions it will turn a grey green with a brown exterior. An addition of ferro-silicon equal to 0.2 per cent. Si can now be made, and the metal begins to deoxidise, due to iron oxide combining with the slag or being reduced by the silicon addition. A sample is taken for inspection in a melter's spoon, a long-handled steel cup coated with slag and immersed in the bath. The operator watches the metal in the spoon, noting its behaviour and the time it takes to solidify. The metal will not be completely deoxidised or "dead" at this stage; nor is it desirable it should be.

Silicon Pick-up

If conditions in the furnace become too reducing, silicon will be reduced from the slag and is rapidly absorbed by the metal. In extreme cases the silicon will be expelled from the furnace through the doors in the form of a grey woolly substance. This phenomenon is called "snowing," and the Si in the bath will pick up 0.5 per cent. in soft steel in a few minutes. Silicon reduction, being a source of danger, must be avoided, and final deoxidation must not take place until the last few minutes prior to pouring. When the operator considers the metal hot enough, ferro-manganese will be added sufficient to finish at 0.7 per cent. Mn with a loss of about 25 per cent. of the manganese added. The heat is poured a few minutes afterwards, aluminium or CaSi being added to the ladle. The extreme fluidity of acid steel is shown by the fact that metal from the shop ladle can be transferred to hand shanks and the whole of a 25-cwt. heat poured into small boxes, the total skulls formed will not exceed a few pounds from the last shanks.

Acid electric steel is very susceptible to oxygen contamination. It absorbs O when being poured and exhibits great sensitivity to moisture in moulds, yet if it is excessively deoxidised it shows non-metallic inclusions under the microscope and poor elongation and impact test figures. A certain amount of FeO present appears to be necessary to secure fluidity for small work, and it requires careful observation and experience to retain fluidity or "life," yet not get castings containing pin-holes due to gas originating in the metal. "Over-reduction," as this complete deoxidation is termed, whilst producing sound castings, cuts down the "life" or fluidity of the steel in the ladle and gives poor elongation and reduction of area in tensile testing.

Melting Cast Iron

The acid furnace is ideal for melting cast iron, particularly for remelting turnings, and is also useful for melting practically every commercial steel except manganese steel, which, of course, would rapidly flux away the hearth (although a few local foundries make Mn steel in acid furnace). Very low carbon steels, such as stainless steel, can be made in the acid furnace, but due to the siliceous non-conducting slag the electrode regulation is not as steady as the basic, and hence a certain carbon pick-up occurs due to momentary dipping of the electrodes in the metal.

The Basic Process

The basic process of steelmaking offers theoretically the means of producing perfectly pure steel, as sulphur, phosphorus, and oxides can be reduced to any desired content. Commercially, however, the aim of basic-steel makers is to produce a steel having a P and S content of 0.02 to 0.04 per cent. and to hasten deoxidation by using aluminium.

Considered from the electrical angle, the basic furnace has a slight advantage in that the slag is conducing and the hearth also, which makes starting smoother and more rapid, and enables the arc to be maintained very steadily, without the bumping and dipping which occur in the acid furnace under a thick slag, hence there is practically no carbon pick-up from the electrodes. One-slag melting is widely practised for many grades of steel, and indeed is general for making manganese steel, but if the advantages of having a basic hearth are to be reaped, two slags are required. About 50 lbs. of lime per ton of metal is used for oxidising and about 75 lbs. per ton for refining. Due to the cost of refractories in the basic furnaces, it is necessary to observe certain precautions to protect them. First, scrap charged must be free from sand, which will lower the basicity of the slag and thereby cut or flux the magnesite banks and also prevent phosphorus reduction. Then the lime used must be dry and free of dust to prevent a spray of lime dust coating the silica walls and roof and fluxing them. Care must be taken that the power input does not exceed the capacity of the metal to absorb the heat, or the lining will suffer rapidly.

A basic slag will change rapidly under the effect of Si dripping from the walls and roof, and has got to be carefully nursed to keep it at the correct composition to perform its functions. It is frequently stated that using lime to make the slag exposes a

dangerous source of hydrogen. Lime absorbs water from the atmosphere, and it is claimed that in the furnace the water is decomposed into hydrogen and oxygen, the hydrogen being readily absorbed by the metal. Hydrogen is blamed for the peculiar defect known as "flaking," which lowers tensile and impact strength, particularly on nickel-chrome steels.

The author has never seen a basic electric steel exhibit this property, but he has observed what appears to be an identical effect in some converter test-bars. Let us consider a "heat" of soft steel to finish C 0.20 to 0.25, Si 0.35, Mn 0.7, P and S 0.04 per cent. Literally anything called steel scrap may be charged—kerosene tins, bedsteads, corset frames, turnings, etc.—though in practice many operators consider it pays to use good clean mild-steel scrap as if for acid practice.

If, depending on the nature of the scrap charged, the melter considers the phosphorus will be sufficiently eliminated, the slag is then removed. The power is left on low voltage and the furnace tilted back and the slag allowed to run off into a slag pot. The furnaceman removes the last traces of oxidising slag with a rabble where possible. The furnace now contains a bath of wild oxidised metal, and is ready for refining. There is considerable controversy as to the first step at this stage. Briefly, there are two schools of thought. Some claim the metal should be deoxidised by the action of the carbide refining slag alone, but this is rather slow and expensive. Others hasten deoxidation by adding ferro-silicon or ferro-manganese to "kill" the bath before putting on the refining slag, the objection to this being that the products of the reaction between the iron oxide and the reducing agents used remain in the metal as finely divided inclusions. The author's practice is to compromise by adding enough FeSi to give 0.2 per cent. Si increase, and then adding the refining slag. This slag consists of about 400 lbs. of lime, 40 lbs. of fluorspar, and 20 lbs. of coke dust thoroughly mixed before charging to the furnace. When this slag is on, the doors are sealed and the current turned on "flat out" for about 10 min. to melt it.

As soon as the slag is melted it is rabbled to mix it and inspected. At this stage it will solidify black, and the metal will be lively in the spoon. A sprinkle of coke is thrown over the bath and the doors sealed again. The input of power must be carefully controlled so that the temperature of the metal will rise slowly but surely, and the slag be kept fluid without becoming siliceous with roof drippings, and cutting the banks.

Neither acid nor basic steel should be "stewed" in the furnace once they are ready. In the acid furnace there will be an increase of carbon and silicon, and loss of Mn, whilst in the basic the refractories suffer chiefly. Due to the nature of the slag which immediately attacks the ladle lining, basic steel is best handled in bottom pour ladles. The clean metal at the bottom of the ladle being first poured, whilst last poured is the top metal under the hot slag, theoretically at least, bottom pouring being the steelfounder's ideal.

Conclusions

Converter steel, if well made, is in the author's opinion equal to any, and has certain unique practical advantages in the foundry. First, steel is ready from the vessel every 20 min., which enables continuous casting to be practised; also up to five heats can be held in a hot ladle for one casting; then, after an outsize job is poured, metal is available to "top up" the heads every 20 min.

The acid furnace is attractive for its simplicity, cheapness of operation, and flexibility. Labour and refractories per ton are cheap and fluxes negligible. For making every steel except stainless and 12 per cent. manganese steel, the acid hearth is ideal, provided clean, modern scrap is charged. For cast iron it seems the melter *par excellence*, as turnings alone can be used and a heat poured every hour and a half. Losses of alloys added to the furnace are slightly higher than in the basic, but steel recovery on actual weighings has been remarkably high, up to 99 per cent. on clean charges.

The basic furnace, whilst metallurgically supreme for its reduction of phosphorus and sulphur, is probably the least suited of the three for ordinary steel castings. Very accurate control of all elements can be maintained, and every steel used can be produced on the basic hearth. Practically, however, it has certain drawbacks in Melbourne. Magnesite is expensive, the bricks costing about 2s. each, and they are not obtainable in Victoria. Due to the fluxing action of lime dust, the life of the silica walls and roof are only one-quarter of the acid furnace, and the cost of lime is an item.

Basic steel is not as hot and fluid as acid, and should be bottom poured for efficiency. For manganese steel, used so extensively for mining machinery, the basic electric stands alone and, of course, for stainless and other difficult alloy steels it is the only furnace worth considering. Melbourne steelfoundries are fully justified in retaining the converter process for the bulk of their castings.

A NEW B.S.I. SPECIFICATION FOR SPOT WELDS

Test-pieces for production control of aluminium alloy Spot Welds, being B.S. 1138—1943, which has just been published, deals with test-pieces for shear testing of spot welds of aluminium base alloys, and is intended to standardise production control procedure and to provide reliable indications of the quality of welds. The Standard describes two test-pieces, one of which is for material up to 18 S.W.G. (0.048 in.) thick, and the other for thicknesses exceeding 18 S.W.G. In addition, there are clauses dealing with the welding procedure, the testing procedure and the various test results which should be recorded. Copies of this British Standard may be obtained from the offices of the British Standards Institution, 28, Victoria Street, Westminster, S.W.1, price 1s. each, post free.

FOUNDRY APPRENTICESHIP

AUSTRALIAN SYSTEM

In the course of a lecture delivered by Mr. G. J. Benson at a meeting of the Institute of Australian Foundrymen, held in Melbourne on December 15, 1943, a review was given of British and American opinion on apprenticeship. The opinions of Dr. Schofield, Mr. Bunting, Mr. E. J. Fox, Mr. R. F. Coates, Mr. R. Oldershaw, Mr. G. L. Harbach and Mr. J. R. Horton were reviewed.

The American position was given by reviewing the systems organised by Fairbanks, Morse & Company, Beloit, Wisconsin; the Caterpillar Tractor Company, Peoria, Illinois, as set out by Mr. M. J. Gregory; and the Cincinnati Milling Machine Company, Cincinnati, Ohio, as outlined by Mr. Herman K. Ewig.

Finally, the author gave the following description of the system used in the State of Victoria.

The moulding trades were proclaimed apprenticeship trades on January 13, 1932, covering jobbing moulding and core-making, jobbing brass moulding and core-making. Every applicant for apprenticeship must possess a certificate of qualification issued by the Apprenticeship Commission of Victoria. The age of entry on probation shall be 15 years. The qualifications necessary are:—(1) Intermediate technical or junior technical certificates of the Education Department of Victoria; (2) the satisfactory completion of a two years' course of study in a junior technical school, or its equivalent; and (3) the satisfactory completion of the eighth-grade course of study of the elementary schools of the Education Department of Victoria.

If he does not possess any of the foregoing qualifications, he may have to submit to an examination at a time and place determined by the Commission before they will allow him to become an apprentice. The term of apprenticeship shall be five years; in the case of a person over the age of 17 years, a term of four years shall operate. Indentures shall be prepared in triplicate. One part shall be retained by the employer, one part by the parent or guardian, and the remaining part shall be deposited with the Registrar of Apprenticeship within 30 days of the execution of such indentures.

Rates of Pay

Rates of pay are subject to award variations, present rates being:—1st year, £1 1s. 6d.*; 2nd year, £1 9s. 6d.; 3rd year, £2 4s. 6d.; 4th year, £3 13s.; 5th year, £4 12s. 6d.

For apprentices required to work overtime, the rates shall be time and a half or double time, as the case may be, with a minimum of 1s. 6d. per hr. An apprentice must obtain 75 per cent. of the possible marks allotted at the annual examinations in theory and practice to reach the standard of proficiency which entitles him to an increase in pay of 2s. 6d. per week for the next succeeding year. This also applies for the next succeeding year, and for the third and fourth occasion on which he attains such standard the sum paid shall be 3s. per week.

The school fees for apprentices shall be paid by the apprentices, but upon presentation of a report by the Commission that such apprentice has attended not less than 80 per cent. of day and evening classes respectively for the term his employer shall refund the school fees paid by the apprentice, provided also that the conduct and manner of such apprentice has been satisfactory. Every apprentice shall, at his own expense, provide himself with the necessary books, drawing instruments and materials required at the classes of instruction unless otherwise provided by the school authorities or other bodies.

Every employer shall permit his apprentices to attend the classes of instruction set down, at the hours specified, provided that they do not exceed one half-day and two evenings per week for 1st and 2nd grade and two evenings per week for 3rd and 4th grade students. An apprentice shall obtain at least 50 per cent. of the possible marks at the annual examinations before he is allowed to proceed to the next grade, and in the final year must obtain this percentage to obtain the final certificate of the Commission. Every employer shall teach and instruct his apprentices in all the branches of the moulding trade to the best of his ability and power, consistent with the type of work carried out on his premises.

A Moulding Trade Committee, consisting of members of the foundry section of the Chamber of Manufactures and the Federated Moulders' (Metals) Union (Victorian Branch) act in conjunction with the Apprenticeship Commission in drafting the syllabus. The Institute of Australian Foundrymen have for some considerable time had a committee working on the subject of apprenticeship training in foundries, and at the present time are working in conjunction with the Chamber of Manufacturers and the Federated Moulders' Union representatives. This combined body works with the object of placing the training of apprentices on a sound and progressive basis.

Lowered Standard

Owing to the utmost difficulty of foundries obtaining boys for apprenticeship, the standard of entry has been lowered and the interest in technical education has waned considerably. Some of the causes are:—(1) The inability to enforce measures of discipline on students who commit breaches of the Act, without bringing them before a Civil Court; (2) advancing students to higher grades without obtaining the necessary percentage of marks; (3) lack of co-operation of some of the employers; (4) influence of some of the tradesmen who are not in sympathy with technical training; and (5) boys who should never have entered foundries, but probably have been forced into them from economic reasons coupled with the parents' idea of learning "a trade" irrespective of whether the boys have any inclination for such work or not.

Under the present system it is not possible to classify apprentices so that the practical work which they receive at school will not clash with that which they receive in their own shops.

* The Australian £ is lower than the £ sterling.—EDITOR.

LIGHT ALLOY v. FERROUS FOUNDING

Brief survey of light-alloy as compared with iron-founding

By J. ROSTRON*

Originally it was intended to present a Paper dealing exclusively with magnesium founding, but permission has been withheld. As an alternative, the present Paper is submitted.

The light alloy metals include such well-known types as the commercial aluminiums; "Y" alloy; silicon aluminium (L.33); the Hiduminium group of R.R. (Rolls-Royce) Alloys; D.T.D. Specifications 133B, 424 and 428, etc.; and the group of magnesium alloys of which the more common are D.T.D. 136A (heat-treated D.T.D. 281) and D.T.D. 59A (heat-treated 289). The manipulation of the aluminium group of alloys is on the whole much easier and simpler, cleaner and less arduous, due, of course, to their lower specific gravity. Working conditions are much cooler and less dangerous. Strict laboratory control, however, is essential on alloys to be used on aircraft components, as there are numerous metallurgical pitfalls to be avoided and very stringent quality standards to be met. Silicon aluminium (L.33) is by far the easiest alloy from the foundryman's point of view and will cause him fewer headaches than any of the others; but with increasing knowledge of the different peculiarities of the other alloys, all of the initial troubles can be overcome.

The magnesium alloys, of course, demand a special technique owing to this metal's affinity for oxygen—an affinity which increases progressively with increasing temperature from its molten state onwards. Thus protection against the atmosphere must be given or fires and explosions result, and it is usually effected by melting under a sulphur gas, or by means of a flux, which forms a cover on the molten surface, thus shutting off contact with the atmosphere. This cover flux may be viscous or dry, or both, that is, it may become viscous shortly after application in powder form, but subsequently dry off into a hard crust. What follows appertains mainly to the aluminium alloys.

Sands

Light alloy sands are usually much easier to utilise than corresponding iron sands, chiefly due to the fact that they do not get burnt as much, owing to the lower casting temperatures used. Local clay-bonded sands are found to give good results. To mention a few, there are Mansfield red, Kidderminster or Bromsgrove, Southampton yellow, Erith, and so forth. Southampton yellow, although somewhat difficult to handle at first, from the moulder's point of view, would have the author's first choice for aluminium alloys, because a minimum of "blind" scabs and "rat-tails" occur with it.

Core sands are many and various, but have much in common in both trades. They may be natural sands or synthetic mixes; the latter will, however, undoubtedly win the day eventually, even if only because one can rely on more consistent moisture content and freedom from contamination, etc.

The chief difference lies in the method of "running," "risering," and "chilling" the work. With the possible exception of L.33, the silicon-aluminium alloy, the majority of the other alloys, and the R.R. group in particular, which have a wide range of solidification, all need very heavy and progressive feeding. Actually, three times as much head as there is casting is not uncommon. Also, due to the fact that aluminium absorbs gas very readily, an effort is made in the running of a job, to reduce turbulence as much as possible by conducting the metal flow through possibly a series of preliminary channels which steadies up the flow and allows the mould itself to be filled as quietly as possible, from uniformly distributed ingates. Intensive chilling or densening is also resorted to on places where it is impracticable to get risers or feeders.

Every apprentice should have some ferrous training early on in his apprenticeship, because it gives him a better understanding of general principles. For example, the need for venting is more apparent in iron than in light alloys; the expansion of the mould gases on casting and the firing of these gases are direct object lessons to him.

Training Russian Neophites

The method of training is also open to criticism. Undoubtedly this varies somewhat from district to district, but the youngster usually has to rely on his own ability to pick up points as he goes along as a point of interest. Some 12 years ago the author had the experience of spending a year, seeing and working, in some Russian foundries. Their method of training youngsters for foundry work, then, is worthy of mention even now.

Disregarding the preliminary encouragement afforded to youth nearly ready to enter industry, in the way of factory visits under expert guidance during school hours, and numerous other forms of preparation, the youth, after actually commencing his trade, is dealt with in a real systematic way. The workshop is usually the main foundry. An official, fully trained and practical instructor, deals solely with trainees. The jobs are graded in categories in order of difficulty. He demonstrates to a new apprentice how to make the simplest of moulds (which naturally come into the simplest category), pointing out simultaneously the reasons why this or that should be done to get good results. The youth is then allowed, and expected, to work the job himself until the instructor is satisfied

* A Paper presented to the Bristol and West of England Branch. The author is on the staff of MAGNAL Products, Limited.

Light Alloy v. Ferrous Founding

that he is fit to take on a higher category job, and so on until the highest stage is reached in that particular factory. Further experience on other types of work and metals is later gained by periodic transference to other factories. Incidentally, scrap produced by the trainee is very carefully examined and analysed and discussions between him and the instructor take place as to the causes and cures for the faults. Theoretical training in the technical schools runs concurrently on one or more days a week also.

It will be readily seen, then, that very rapid advancement is made working on these lines, and it is undoubtedly the reason why the author was astounded, at first, to find youths of 16 to 17 years old making large intricate jobs, which in Britain would certainly be given to a mature and experienced craftsman.

Patternmaking

Patternmaking costs generally in light alloys are appreciably higher than those for iron, because usually, and especially on patterns for aircraft components, much finer limits are demanded. Because only the highest grades of timber, as a rule, may be used, to avoid even slight distortion or warping. Skeleton patterns, strickle work and other labour-saving devices for, for instance, "one-off" jobs, can very rarely be adopted by the light alloy patternmaker. A bigger advance has been made by this section of the light alloy industry over the ironfoundry, from the point of view of really getting down to studying patternmaking, not in the light of turning out a good pattern from pride of craftsmanship—although this also enters into it—but from the foundryman's angle. The best way of splitting a job to give the best results on the moulding floor, of incorporating runners and risers, of making gauges and jigs, core driers, the studying of drafts and clearance tapers, and so forth, is invariably sought. This policy of paying more attention to the pattern side, although costing more initially, is wise and repays itself a hundredfold in the long run.

Dies

Here again the light alloy industry scores a big advantage. Aluminium and magnesium lend themselves much more easily than iron to both gravity and pressure die work. Their lightness, their low melting temperatures and easy manipulation make them readily adaptable to this type of work. In fact, the difficulties of working cast iron efficiently on die work have, to personal knowledge, not yet been overcome.* Several attempts having been made, without very much success, and in the meantime light alloy gravity and pressure die work are forging ahead, giving tremendous increases in output. One or two points governing die founding are, *inter alia*, quantity orders warranting the extra expense of a metal mould, simplification of component design, the advantage of casting to fine limits, and the probable cutting down of machining costs.

Fettling

One would be inclined to think that the fettling of aluminium magnesium alloys is a very easy matter compared to iron castings, owing to their comparative "softness," and to some extent this is true. The band saw, an indispensable machine in the light alloy fettling shop, used chiefly for cutting off runners and risers, appears to go through these like cheese. In actual fact, great care must be taken on every operation. A boss or a flange slightly over-filled is sufficient to scrap a casting.

Tumblers or similar machines for cleaning or giving improved appearance to castings cannot as a general rule be used, as with iron, although the sand or shot-blasting processes are often practised. Speaking generally, however, the chief difference lies in the problem of the light alloy fettling shop's ability to fettle off the runners and risers, which the foundry find necessary to use, in sometimes the most impossible and awkward places, to produce radiologically sound castings.

Radiography and Heat-treatment

Every light alloy foundry must be equipped to do its own radiography and heat-treatment departments if it is to run really efficiently and cater for aircraft components. These functions are usually controlled by the factory laboratory and play a big part in ensuring the quality output of the firm. They often are the cause of many headaches suffered by the foundry supervision staff, but, used intelligently, they are bound to assist them to overcome many faults not otherwise apparent. Heat-treatment faults are usually those of distortion.

General

It may be thought that the above tends to convey the impression that the light alloy industry seeks to oust, or replace, to some extent ironfounding. This impression should be corrected, because personal opinion is that each has its own distinctive role to play.

What should be stressed is this, that the foundry industry as a whole has never properly taken its rightful place in engineering, owing to the usually dirty and arduous nature of the job, and it is in the newer light alloy industry that the first links towards a new conception of the foundry are being cast.

If the industry is to attract youth, who is the craftsman of to-morrow, into this branch of industry—youth which has nowadays, and will have in the future, many other more attractive occupations—then the trade, and in particular the iron section, will have to pay more attention and make more effort to make conditions more attractive. For instance, why should not all ironfoundries (which is by far the dirtiest section) instal shower baths and lockers, as the Americans and Russians do, so that a man can remove the "mark of his trade" by changing before leaving work?

* An exception is the Eaton Erb process, which is now in successful operation.—EDITOR.

THE PRODUCTION OF CAST-IRON PIPES*

Three distinct methods are discussed

By WM. PHILLIPS

Throughout the world cast-iron pipes are standard; and their wide use during the past century has brought about a tremendous advance in the science of water supply, distribution and sanitation. In the plant supervised by the author the moulds were hand-rammed and the boxes lifted from the machine to floor, cored and closed by hand. While this was efficient for small output, it would not serve where a large output is desired, and could not meet the competition of a large foundry laid down with the most modern machinery to turn out pipes on a large scale.

Up to the present any attempts to produce R.W. and soil pipes by more up-to-date methods have worked along the line of one plant designed to manufacture all sizes. This is neither practical nor possible, and this is borne out by the plants at present in operation. They have usually gone no further than 4-in. soil pipe, and where 2-in. soil pipe has been attempted by similar methods, the quality and production have been such that it has not justified the expense, and in some cases the old methods have been reintroduced for that size. The problem must be tackled by studying it in groups, say 2 in., 2½ in. and 3 in., 3½ in. and 4 in. in another, and 5 in. and 6 in. in a class by themselves.

The number of pipes per flask has also been experimented with. Although two pipes per box have become fairly standard, larger numbers have been tried. The four or five pipes per box, according to size, is, however, again to be tried out.

The author is convinced that more than two per box, however, is entirely wrong, and those attempting it will find they are backing the wrong horse.

There are several methods in which the problem of reducing costs of manufacture can be attacked:—(1) The production of a plant designed to do all the job mechanically; (2) a plant designed to do the moulding and core-making only by mechanical means; and (3) adapting the present hand methods to mass production.

Mechanical Methods

Commencing with method No. 1, which would be eminently satisfactory for the production of 3½-in. and 4-in. sizes. The job is possibly best suited for the Sandslingers. Two Sandslingers (stationary type) are required with a turntable in front of each, each turntable having two stripping plate machines, one for drag and one for top part, all placed near the centre of the shop at one end, the conveyor running alongside, the machines being inside the conveyor circle. A core machine would be placed against the wall opposite the moulding machines. The turntable would be swung round by hand and the boxes placed on the conveyor by hand. The cores would also be placed by hand. The boxes would travel on the conveyor lengthwise and be poured opposite the cupola, which would be placed just outside the shop near the centre, longitudinally. The shake-out need not be described, as it is a normal feature in all continuous-cast practices. The sand would be reconditioned and returned to the machines underground. The flasks would be returned on the conveyor and the core bars hung on a special power-operated Monorail. Special arrangements regarding the core sand, which would be different from the moulding sand, could easily be made so that that sand was returned to the core machine.

The pipes would be fettled and cleaned at the end of the shop and conveyed to the dipping plant outside by an H-beam Monorail.

Restricted to Mechanical Moulding

Again the Sandslinger is recommended, but it would be of the tractor type. Only one machine would be required per row, with one turntable containing two stripping plate machines, as for the first method. This method is suitable for 3½-in. and 4-in. sizes, two in a box, and 5-in. and 6-in. sizes, one in a box. The machines would leave the boxes lying in a row, and casting would not be commenced until the moulding had been completed. The core machine in this case would be placed at the commencing end of the row and be operated by two men who would make the cores and place them. The casting would be done by the usual four-lip ladle conveyed by a Monorail running over the centre of the row lengthwise. The emptying would, in this case, be done by a separate squad at the finish of the day's work. This squad would also cut up and recondition the sand for the following day, withdraw the core bars, stack the arbours in a suitable place near the core machine, and remove the pipes to the fettling shop.

Hand Methods

Immediately one tackles the problem of mass-manufacture of pipes, one encounters methods for producing 2 in., 2½ in. and 3 in. Both in America and on the Continent they have made all sizes by one method. In America the problem is simplified by the fact that the length of the pipe is only 5 ft., although on the Continent they adhere to the British size of 6 ft.

None of the small sizes of pipes, however, is suitable for rapid production in any of the above methods, and although it has not, so far as the author is aware, been tackled from the basis of present methods of hand moulding, and instead of each moulder doing the whole job of moulding, core-making, casting and emptying, each man could be allocated a separate job, sand being supplied from overhead both for cores and moulding, and the boxes conveyed to a point for cast-

* A Paper read at a meeting of the South African Branch of the Institute of British Foundrymen. (Abridged.)

Production of Cast-Iron Pipes

ing, emptying and returning, much in the same way as method No. 1 described.

It is a personal opinion that, done in this way, the outlay of capital would be much reduced and the results would be of much better quality than the attempts which are at present being made by machine moulding. A stripping plate machine might, however, be introduced with great advantage.

DISCUSSION

MR. CACHET said he noticed that the trend in the methods described in the Paper had always been to bring the sand and metal to the box. Mr. Phillips made no mention of a central casting place. In his opinion production would be speeded up by bringing the boxes on conveyors to the machine. He asked Mr. Phillips if his firm in those days had considered transporting the moulding boxes.

MR. PHILLIPS said he was glad that the point had been raised, because his firm decided to tackle the problem from this point of view. The moulds were rammed up by a Sandslinger, taken to the cupola, and cast. After casting the pipes were taken to the rumbler sets which were outside the moulding shops, and thence to the buffers. Finally they were transported to the heating chamber and coating chamber. As far as possible everything was brought to the casting place.

Replying to the President, MR. PHILLIPS said that the advantage of using a stripping plate was that there was no necessity for the moulder to use any tools at all, and perfect joints were obtained.

The PRESIDENT recalled that he had seen soil pipes turned out by the thousand without the use of a stripping plate. The pipe pattern was given a little turn and the pipe always revolved in the mould. He still failed to see why a stripping plate was necessary, because the pipe was revolving and the pattern was clear of the half-way line.

MR. PHILLIPS said that this was the old method described early in the Paper. In this case a lever was simply thrown over and the pattern stripped through, the pipes being absolutely perfect.

MR. CACHET was very intrigued by the suggestion of a revolving pipe, but it seemed to him that if an ordinary pattern and a half-pipe on each side were replaced by a revolving pipe, a round pipe would not be obtained on account of the thickness of the plate.

Indian Practice

The PRESIDENT said that in the first place there were not two half pipes but only one, which was simply swung over until it was flush with the point of the plate. In Calcutta they used to make stove pipes, 6 ft. 6 in. long by 2½ in. dia. and only $\frac{3}{16}$ in. thick. These had a square lug on, so that it was impossible to revolve the pattern. The problem was to make them quickly and cheaply and still get the lug on one side and the hexagon on the other. In this particular case they made a stripping plate. They drew the pattern about 2 in. below to release the lug at one end. There was no conveyor. The pattern was made to run on wheels and mounted on a substantial frame. They began at one end of the shop and ran through, so it was a very small matter to cast the moulds. There was a very small percentage of defective casting and short runs.

MR. TONGE thought there could be no argument against the use of a stripping plate in the production of pipes of the type mentioned.

The PRESIDENT explained that when they used a stripping plate there was a square lug on the top and bottom. This difficulty could not be overcome without a loose piece, which they did not want. Bank pipes were made on the same system without stripping plates. The box was on hinges, and they simply rammed it up and swung it over.

MR. HOLDSWORTH said that he had had the good fortune to visit a foundry where they were making pipes 12 ft. long, which were being produced in green sand at the rate of approximately 30 a day by an unskilled man and an assistant. The pipes were made in a row, and green sand was also used for the cores. He asked about the method of running, and what types of metal and sand were used.

MR. PHILLIPS stated that this was the system of one in a box, which was behind the times if production had to be on a big scale. In Great Britain and the Continent 6 ft. was the size adopted. Using the four-lip casting ladle method, the standard day's work of a man and his assistant was 26 pipes. By the modern method two men could make 120 pipes and one core machine 320 cores per day. The sand used was purely a natural sand. The molecule grain, so far as he remembered, was 0.02, and the permeability of the sand was very high. This sand was used for both the moulds and cores. A four-lipped ladle was used for running. With ¼-in rainwater pipes an almost perfectly straight pipe was obtained. The downgate was on to a runner, and the pipe was run on the side of the joint.

The PRESIDENT said that in the production of stove pipes they made a gate about 6 in. long coming to a knife edge. They simply ran the cleaner along the gate after drawing the runner pattern and poured at each end. This method was found very satisfactory and gave a big area in which to pour the ladle. The pipes were 6 ft. long by $\frac{3}{16}$ in. thick.

MR. PHILLIPS, in reply to Mr. Holdsworth's inquiry as to how the cores were made, said the old method was to have a saddle rammed in the core with the screw placed on the saddle, the force of metal lifted the core, the screw determined the regular thickness of the section of pipe.

Mr. Phillips, in describing the method of core-making to which he referred, explained that the core arbour was placed in the machine, and as the arbour revolved the sand dropped a distance of 12 ft.; the cutting knife then cut off at the given diameter, the whole operation taking only 10 secs. per core, against the old method of 14 or 15 min.

In reply to a question by Col. Grose, MR. PHILLIPS

said that among the finest pipes cast were 9-ft. gas pipes which had to stand up to really high pressure. After being cast on the bank, they were put to a very severe test, and were subsequently known as "bank pipes."

Referring to a statement by Mr. Holdsworth, MR. ABNETT expressed the opinion that a well-known Pretoria foundry could successfully cast such pipes. He thought that Mr. Phillips could be regarded as managing one of the pioneer firms of mass production in the Transvaal. Mass production had come to stay. They would have to be very careful that it was not abused. As Mr. Lion-Cachet had pointed out, they had a duty to the human element. Mr. Phillips had shown how a mass-production firm could be run on human lines. They should be very careful not to exploit mass production and look on labour as a commodity.

Centrifugal Castings

Agreeing with Mr. Abnett, MR. PHILLIPS said that happiness was essential to efficient production. He then referred to a method described to his employer at a Congress in Düsseldorf, whereby eight pipes were cast simultaneously by centrifugal methods. A man and a boy could cast and handle 400 of those pipes in two hours. He suggested that another article suitable for mass production would be filter plates and presses for sugar mills. In Falkirk, Scotland, they received an order for about 3,000. They evolved the stripping plate system, put a Sandslinger into operation, and with three men and an apprentice production jumped to 30 in a day's work. Ironfounders in South Africa must realise that mechanical methods were the only ones which were going to survive wherever practicable.

The PRESIDENT pointed out that the small quantities of filter press plates ordered made it necessary for Durham firms to make them from a loose pattern. Orders large enough to justify the Sandslinger and stripping plate method had not been given.

Post-War Conditions

MR. LION-CACHET said that the Papers read at the Branch's very well attended meetings generally dealt with awkward jobs carried out with no tackle. These Papers were very valuable, but it was high time South African foundrymen adopted a different attitude and methods. Otherwise they would have no chance of meeting the post-war competition of mass-produced articles. Despite the progress made during the war they were very far behind. Machines gave a large production with better facilities for the worker, but they had to decide how their labour should be employed and try to regain the time lost through being so far from any manufacturing centres. They must abandon their extravagant attitude towards labour, time and material. Since the war they had started the quantity production of castings on a small scale, but they were not yet in a position to undertake any real manufacture.

MR. WATSON said that in the Union moulders went through more than in any country overseas, because they got no repetition work and had to learn to do without tackle, and he felt that South African moulders could hold their own with overseas moulders in jobbing work.

Early Preparation

MR. CACHET said it was the work done without tackle which had built up the country to its present position. Foundrymen overseas had not learnt production methods in a few years. Their markets had grown gradually. He warned members that when the war ceased the time given them to step from jobbing to manufacture would be very small, and they must therefore be prepared. Through Papers and discussions they should cultivate the right attitude of mind. They would still have difficult jobs to do. Mass production would not do away with the skilled moulder, whose services would be in a greater demand than ever. On the other hand, opportunities would be given to a large number of people to earn a reasonable living.

MR. MILLER did not share Mr. Cachet's optimism as to the future of skilled labour when mechanism became general, and considered that the outlook for moulders was not good.

MR. ALEXANDER said history had shown that mass production increased the demand for skilled men. Moreover, there would be many jobs of which large quantities were not required. Demand grew with production.

MR. WATSON said that his experience of machines was that far from putting men out of jobs, more skilled men were soon required.

Replying to Mr. Miller, who pointed out that oversupply was as bad as under-supply, MR. PHILLIPS said that after the war the Union would have to depend on its own resources, and foundrymen were going to be busy for a long time to come.

MR. ABNETT said that more people must be absorbed into industry to create a market. There would then be no danger of over-production.

B.B.C. EUROPEAN OBSERVERS VISIT SHEFFIELD WORKS

On February 28, B.B.C. observers for Belgium and Flanders, Czecho-Slovakia, France, Germany, Holland, Italy, Portugal, Spain, Sweden and Yugoslavia, with Mr. W. Gibson Parker (European Production Director of the B.B.C.), visited the Brightside Works of William Jessop & Sons, Limited, makers of fine alloy steels, to witness the various phases of production so that they might see at first hand the manufacture of many different articles essential to the war effort.

Other guests present included Mr. Colin Laycock and Mr. A. R. Knowles, president and secretary respectively of the Sheffield Chamber of Commerce, and officials of the B.B.C. After inspecting the various departments the observers were the guests of the company at a luncheon presided over by Mr. L. Chapman, the managing director.

THE NOMENCLATURE OF ALLOYS

The report of the Institute of Metals' Committee on the Nomenclature of Alloys, published in 1914 ("Journal," Vol. 11, pp. 45-56), recommended that alloys should be denoted by the names of their component metals, placed in the order of increasing numerical importance from the point of view of chemical composition by weight.

In general, the Institute has endeavoured to follow this system in its publications, although familiar terms in universal use in English, such as brass, bronze, nickel silver, have naturally been retained where appropriate. The system recommended in 1914 has not, however, been widely accepted, and the contrary method of placing first the metal present in largest proportion is fairly common in this country and is general in America and other countries. The Council has therefore decided, on the recommendation of its recently constituted Nomenclature Committee, that in future the practice of the Institute's publications shall conform with current usage elsewhere.

The following rule will therefore be adopted forthwith in the "Journal" and other publications of the Institute:

When an alloy is named by stating the chief elements it contains before the word "alloy," the elements will be given in the order:

(1) The element present in largest proportion, followed by

(2) The other elements present. These will be stated in order of descending proportion by weight, except in a very few cases where another order is well established. In such cases the customary order will usually be followed.

It will be observed that the Institute has made this rule for its own guidance, and that the use of established terms and expressions such as brass, bronze, leaded gunmetal, is not in any way affected.

The following examples illustrate the nomenclature to be adopted by the Institute:

96 per cent. aluminium, 4 per cent. copper—an aluminium-copper alloy.

90 per cent. copper, 10 per cent. lead—a copper-lead alloy.

94 per cent. aluminium, 5 per cent. zinc, 1 per cent. magnesium—an aluminium-zinc-magnesium alloy.

88 per cent. lead, 12 per cent. tin—a lead-tin alloy.

94 per cent. magnesium, 5 per cent. aluminium, 1 per cent. zinc—a magnesium-aluminium-zinc alloy.

The new system will be employed in the Institute's publications from the beginning of this year.

TRANSFERRED WORKERS

The Ministry of Labour and National Service has issued a leaflet which sets out clearly the allowances available to men, women and juveniles when they are transferred officially to work in a locality beyond the daily travelling distance from their homes. It covers getting to the job, the arrival, visits home and emergencies.

PROGRESS IN IRON AND STEEL MAKING

During 1942 one-third more iron was produced by the 230 blast furnaces operating in the United States than by the 351 in production during 1918, stated C. D. King, of the United States Steel Corporation, at a meeting of the American Institute of Mining and Metallurgical Engineers. Basing most of his remarks on Steel Corporation records, he gave credit for the increased efficiency of present-day blast furnaces to "improved methods of charging materials, air blowing, blast heating, gas cleaning, as well as better iron and slag handling systems" which have made it possible to operate larger furnaces.

Actual figures show that the average blast-furnace production per day in 1918 was 349 net tons, while to-day it is well over 700 tons. Similarly, the largest furnace in existence in the last war produced approximately 630 net tons per day, while a number of units are now consistently producing 1,500 tons daily. Another contributing factor to high production is the longer life of furnaces between linings. In 1918 the average furnace produced approximately 625,000 tons before relining, but now this figure has risen to 1,800,000 tons and in some cases records of as high as 3,000,000 tons have been obtained.

Much the same applies to steel ingot production. Although approximately the same number of Steel Corporation subsidiary plant open-hearth furnaces are in operation, they are turning out 80 per cent. more steel. Furnaces are larger it is true, but many improvements in design, methods of operation and furnace control have been developed since the last war. Speaking of one of the Pittsburgh District plants, Mr. King said: "In 1918 this plant was considered a modern unit by the old standards and at that time was tapping 110 net ton heats with a daily production of 194 tons per furnace and a fuel consumption of 6,600,000 B.Th.U. per net ton of ingots. The plant has since been improved and today the furnaces are tapping 169 net ton heats, or 53 per cent. larger, producing 310 net tons per day per furnace, or 60 per cent. more, and consuming 3,700,000 B.Th.U. per net ton of ingots, or 44 per cent. less." Even these performances are being surpassed.

NOTES FROM THE BRANCHES

Wales and Monmouth.—On February 26, Mr. Derek Wells, of K. & L. Steelfounders, Limited, Letchworth, visited Cardiff to re-present the Paper which he gave to the 1943 Conference. The event took place in the canteen of a Welsh steelfoundry, which was inspected by a record gathering of members. Between the two events tea was provided by the foundry management. After an animated discussion, Mr. Wells was thanked by Mr. H. Curran and Mr. Kelly.

WE SINCERELY THANK Wright & Company, of Clarence Street, Sydney, Australia, for sending us a monthly tear-off wall calendar.

POST-WAR EMPLOYMENT

TRADE UNION VIEW OF DEMOBILISATION

Demobilisation on the basis of "first in, first out" will not work. That is the opinion expressed by Sir Walter Citrine, general secretary of the Trades Union Congress, writing in "The T.U.C. in Wartime." It will be imperative, he says, for certain grades of workers to return at once to industry whatever their length of service. He suggests a reverse schedule of reserved occupations and also a census of people who will want to leave industry when the war is over.

Sir Walter Citrine points out that in settling down to a peace economy there will be a limit to the things that can be done right away. Long-term plans will be needed, but there will be an emergency period in which a great deal of munitions production will cease more or less abruptly, and careful preparations will be necessary to avoid a muddle. To avert prospective trouble he suggests that all workers should be given a holiday with pay, graded up to a month according to length of service either in the Forces or in war industry. Another suggestion is that during this period all overtime should cease wherever practicable.

Compulsory registration of all persons seeking employment should be retained. Powers of direction would be resented unless used only as a last resort, but any unemployed worker unreasonably refusing employment in an industry which the Government considered vital should not be allowed to draw unemployment benefit. Sir Walter Citrine says the trade union movement is as much alive as anyone to the possibilities of inflation, and, given sufficient control over the other factors that tend to create inflationary movements, there would be no reason to fear that inflation would arise from the free play of collective bargaining. The trade union movement was not irresponsible. Too much could be made of the argument of the immobility of labour. The trade union movement would not prove a hindrance if the right methods were adopted.

AMERICAN EXCHANGE PAPER

Mr. M. J. Gregory, factory manager of the Caterpillar Tractor Company, Peoria, Ill., is the author of the Exchange Paper to be presented on behalf of the American Foundrymen's Association to the annual meeting of the Institute of British Foundrymen. Born in Rhode Island, Mr. Gregory was educated in the public schools there, and later served as an apprentice at Brown & Sharpe Manufacturing Company, Providence, R.I. In addition to serving his apprenticeship, Mr. Gregory studied at Brown University and Massachusetts Institute of Technology, and had the privilege of being student of metallography under the personal direction of Dr. Albert Saveur. Mr. Gregory is now a director of A.F.A., having presided over the Quad City Branch and served on various committees of the Association. The subject of his Paper is "Aluminium Cylinders for Air-cooled Aircraft Engines."

OBITUARY

MR. JOHN BINNS, managing director of Binns & Speight, Limited, engineers and ironfounders, of Bradford, died recently, in his 65th year.

MR. FRED ELLISON, late managing director of Fred Ellison & Company, Limited, electrical and mechanical engineers, of Bradford, died recently. He was 67 years of age.

MR. WILLIAM C. LUSK, deputy chairman and managing director of Associated Electrical Industries, Limited, and chairman of the British Thomson-Houston Company, Limited, died recently, aged 68. Born in Nashville, Tennessee, and educated at Yale University, where he graduated B.Sc., he received his electrical training in the organisation of the General Electric Company (of New York), who selected him in 1901 to go to India to represent them. Later he came to England to join the London staff of his company, eventually becoming manager. In 1910, he formed his first connection with the British Thomson-Houston Company, being appointed manager of the export department. In 1922, he became managing director. He took a leading part in the development of Associated Electrical Industries, Limited, and he became deputy chairman of that company and chairman of the B.T.H. Company in 1929. Mr. Lusk became a naturalised British subject in 1938.

ISCOR WORKS EXTENSIONS

Presiding at the annual meeting of the South African Iron & Steel Industrial Corporation, Limited, held at Pretoria on November 24, Dr. H. J. van der Bijl (chairman) said that the average manufacturing profit for the last three years was lower by over £450,000 per annum than the pre-war profit level. Their policy was to refrain from making any general increase in steel prices until it became absolutely necessary and, even then, to limit increases to a minimum.

The chairman announced that the major units of their extended plant had commenced production or were in process of being started up, and they were looking forward to an appreciable increase in output. These extensions were designed to bring Iscor works' output capacity up to about 600,000 ingot tons per annum.

Foundry Queries

Rust Prevention.—A reader suggests that a method for the prevention of rusting of castings between shot blasting and subsequent processing is to immerse them in a special lanoline solution such as is made by Silvercrown, Limited, of 178, Goswell Road, London, E.C.1.

We also learn that General Metallurgical & Chemical, Limited, 120, Moorgate, London, E.C.2, can supply an inhibitor which, if dissolved in water to the extent of about 1 per cent., has a marked effect in restraining the rusting of iron and steel.

NEWS IN BRIEF

THE BRITISH STEELWORK ASSOCIATION has moved to Egginton House, Buckingham Gate, London, S.W.1.

AMERICAN ZINC PRODUCTION has risen progressively from 706,100 short tons in 1940 to 972,060 tons in 1943.

THE STRONG MANUFACTURING COMPANY, of Sebring, Ohio, which in normal times makes enamelled ware mostly for the refrigerator trade, has converted some of its plant to turn out stainless steel army mess trays and billy cans.

A LECTURE ENTITLED "Combination Steels and their Uses—Laminated Steels" will be given by Mr. F. Gardner (of Sheffield), to the Keighley Association of Engineers at the Victoria Hotel, Keighley, tomorrow (Friday), at 7.30 p.m.

ACCORDING to Mr. C. W. Fergusson, chairman of the Natal Engineers' and Founders' Federation, the South African engineering industries now employ 50,000 Europeans and 10,000 natives, and pay out in wages over £40,000,000 annually.

STERNOL, LIMITED, "Grey Timbers," Westerham Road, Limpsfield, Oxted, Surrey, have published an instruction card dealing with the correct method of care, maintenance and general handling of barrels and drums. They will be pleased to send a copy of this card on application.

AMONG NEW WORK of interest to the foundry industry started by the British Standards Institution are the following:—Magnesium alloys; solid-fuel appliances for low cost housing; gas appliances for low cost housing; stop-tap guard-pipes; and cast manhole covers, street gullies and road fittings.

A MEETING OF the Manchester Association of Engineers will be held tomorrow (Friday), at the Engineers' Club, Albert Square, Manchester, at 6.30 p.m., when a Paper on "Mechanical Filtration of Water for Industrial and Domestic Purposes" will be given by Mr. J. Dillwyn Joseph, A.I.C., P.A.Inst.W.E.

THE WORKERS of Thos. Firth & John Brown, Limited, Sheffield, have raised enough money to buy three vans for entertaining the Forces. One of these has been handed over by Sir Allan Grant, managing director, to the Y.M.C.A. for entertaining the troops on lonely sites in Yorkshire, and for educational and religious work.

LORD DUDLEY, Regional Commissioner, addressing a meeting of the Wolverhampton and District Production Committee, said he felt there was room for a permanent association of that kind where industrialists could meet and make contacts. He hoped that from the wartime organisation there would arise a permanent peacetime production exchange.

A SERIES OF LECTURES with discussion arranged by the Fuel Efficiency Branch of the Ministry of Fuel and Power is being given at the Institute of Mechanical Engineers. Subsequent lectures in the series cover boiler trials, shell-type and water-tube boilers and appliances, space heating installations, etc. The lectures are on Wednesdays, at 6 p.m.

A MEETING of the West Riding of Yorkshire Branch of the Institute of British Foundrymen will be held at the Technical College, Bradford, on Saturday next, March 11, at 6.30 p.m., when a joint Paper will be given by Messrs. G. W. Nicholls and R. Oldershaw on "Moulding Sand and Gases in Relation to Casting Defects." The Branch Council will meet at 6 p.m.

MR. ELLIS SMITH asked the Prime Minister in the House of Commons if he would have a public inquiry made into the growth and effects of monopoly development, cartel and trade arrangements. Mr. Attlee, the Deputy Prime Minister, who replied, said that no public inquiry would be made; but the subject was being carefully studied by the departments concerned.

A JOINT MEETING of the Cleveland Institution of Engineers and the Iron & Steel Institute will be held on Monday next, at 6.30 p.m., at the Cleveland Scientific and Technical Institute, Corporation Road, Middlesbrough. A Paper entitled "A Review of Basic Open-Hearth Practice at an Australian Plant, by Mr. R. L. Knight, will be presented for discussion by Mr. A. Robinson.

THE QUARTERLY MEETING of the Council of the London Branch of the I.B.F. is being held on March 17. Will intending applicants for membership, their proposers and supporters, please make every effort to ensure that the application forms reach the honorary secretary well before this date, as otherwise a three months' delay is incurred? This no doubt applies to many other branches.

TO FACILITATE certain classes of slow speed machine-tool work and many of the manual operations, *e.g.*, hand tapping and screwing, in some of which tool breakages are still comparatively high, a cutting compound by the name of "Trefolex" has been produced and arrangements have now been completed with the Pearl Varnish Company, Limited (the makers), for the General Electric Company, Limited, to distribute and deal with all sales.

THE ANNUAL GENERAL MEETING of the Institute of Metals on Wednesday next, March 15, will be held at the Institution of Mechanical Engineers, Storey's Gate, London, S.W.1, and not at Grosvenor Gardens, as previously announced. The meeting will commence at 11 a.m. and after the transaction of the ordinary business, the meeting will be resumed, following the luncheon adjournment, at 2.30 p.m., when Dr. W. Hume-Rothery, F.R.S., will give a lecture on "Modern Views of Alloys and their Possible Applications."

ACCORDING TO Mr. W. W. Rose, executive vice-president of the American Gray Iron Founders' Society, manufacture of the 2,000,000 electric irons and 50,000 bathtubs authorised recently by War Production Board in its first important order permitting resumption of output of needed civilian goods will require production of nearly 10,000 short tons of grey iron castings. Production of the 2,000,000 electric irons will place orders with grey iron foundries for 1,250 tons of castings. Mr. Rose estimated in expectation that practically all the irons will have cast grey iron sole plates. The 1944 output of bathtubs will call for manufacture of nearly 8,750 tons of grey iron as cast.

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STANTON MACHINE CAST PIG IRON

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Length	22 inches
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COMPANY RESULTS

(Figures for previous year in brackets)

Guest Keen Baldwins Iron & Steel Company—Dividend on the ordinary capital of 6% for 1943 (5%).

Bairds & Dalmellington—Net profit for 1943, £270,791 (£227,769); final dividend of 12%, making 16% (same).

Lancashire Steel Corporation—Dividend at the rate of 7% per annum for the period of ten months ended October 31, 1943, on the "A" and "B" ordinary stock.

Dorman Long—Profit for the year to September 30 last, £894,830 (£805,830); to general reserve, £150,000 (£65,000); ordinary dividend of 8% (same); forward, £63,171 (£55,746).

M. Mole & Son—Net profit for 1943, after tax, £7,940 (£7,348); dividend of 10% and bonus of 2½%, £5,207 (same); contingencies reserve, £2,000 (£1,500); forward, £7,751 (£7,018).

L. Gardner & Sons—Profit for 1943, after depreciation, tax and other reserves, £51,555 (£46,379); dividends received, £18,810 (£18,744); preference dividend, £5,041 (same); ordinary dividend of 50% (same), £53,451; forward, £240,743 (£170,006).

Foster, Yates & Thom—Net profit for year to September 30, 1943, £59,552 (£58,657); tax provision, £49,500 (£43,000); dividend of 5% (6%); to general reserve, £4,000 (£5,000); to war contingencies reserve, nil (£3,500); forward, £1,827 (£1,775).

Coventry Gauge & Tool Company—Trading profit for the year ended August 31, 1943, after provision for taxation, £149,514 (£138,699); net profit, £24,021 (£30,991); dividend of 7½% and a bonus of 7½%, both free of tax, £18,750 (same); forward, £85,098 (£79,892).

Redpath, Brown—Profit for the year to July 31 last, after depreciation, taxation, War Damage Act contributions, and a contribution of £5,166 to staff pensions, £44,730 (£47,688); preference dividend, £5,250; free-of-tax dividend on the ordinary shares, £39,480 (£42,438); forward, £172,244 (same).

NEW TRADE MARKS

The following applications to register trade marks appear in the "Trade Marks Journal":—

"METSAL"—Fluxes. METAL SALTS, LIMITED, 16, Newgate Street, Chester.

"PROMONTORY"—Welding rods. THOS. P. HEADLAND, LIMITED, 164-168, Westminster Bridge Road, London, S.E.1.

"IRONCRETE"—Building parts made of iron and concrete. SCOFFIN & WILLMOTT, LIMITED, Ironcrete Works, Barking By-Pass Road, Barking, Essex.

"HYDRA"—Unwrought and partly wrought common metals and their alloys and wire (non-electric). HALL & PICKLES, LIMITED, 64, Port Street, Manchester.

"PERPRO"—Unwrought and partly wrought metals. PRODUCTION TOOL ALLOY COMPANY, LIMITED, Harlington Works, Harlington Road, Sharpenhoe, Bedfordshire.

"ALOCLENE"—Chemical compounds for use in cleaning aluminium prior to welding. SUNBEAM ANTI-CORROSIVES, LIMITED, 5, Kensington Park Gardens, London, W.11.

PERSONAL

MR. F. C. MANNOX has been appointed managing director of Murex, Limited. MR. H. C. GREEN has become general manager of the company.

MR. W. H. SMITH, a director of Allied Ironfounders, Limited, has been appointed deputy managing director. He will continue his present offices and duties.

MR. FRANK BIRD, a director of Jarrow Metal Industries, Limited, has been appointed to the board of Sir W. G. Armstrong Whitworth & Company (Ironfounders), Limited, Close Works, Gateshead-on-Tyne.

MR. ANDREW SMITH, previously Director of Aircraft Production Factories (Equipment), Ministry of Aircraft Production, has been appointed London manager for Davy & United Engineering Company, Limited, Sheffield.

MR. W. J. BROOKE, who recently retired from the managing directorship of John Lysaght, Limited, Normanby Park Steelworks, Scunthorpe, received a presentation from the employees at a recent meeting.

SIR WILLIAM PALMER has been released by the Ministry of Production to take up the post of Principal Industrial Adviser to the Board of Trade. He will be specially concerned with major questions of industrial reconstruction policy in connection with the engineering and other industries at present mainly engaged on war production.

MR. P. D. PINCOTT, who recently resigned his position as foundry manager with J. & E. Hall, Limited, engineers and ironfounders, of Dartford, Kent, has received a presentation from the company. Mr. V. A. Patterson, managing director, presided over a gathering, which included representatives from each of the three foundries. The presentation took the form of a despatch case. The staff presented Mr. Pincott with a set of gold cuff-links. He has now taken up a position with Wallwork Gears, Limited, Manchester.

Will

LEGGE, JOSEPH, founder of J. Legge & Company, Limited, brassfounders and lock manufacturers, of Willenhall £73,923

NEW COMPANIES

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

South Shields Products—Engineers, tool makers, etc. £10,000. T. W. Vernon, 4, Spanish Place Mansion, London, W.1, subscriber.

English Silica Industries, Ship Building, Swadford Street, Skipton, Yorks—£1,000. C. Burkill, A. S. Baylis, M. A. Thompson, and F. Haggis.

W. M. Friend (Grantham), 49, West Road, Bourne, Lincs—Agricultural and general engineers, etc. £5,000. W. M. Friend and J. N. P. Richards.

R. D. Cardiff—Engineers, manufacturers of piling plant and lifting gear, etc.—£10,000. F. W. Watts, 25, Netherwood Street, London, N.W.6, subscriber.

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Raw Material Markets

IRON AND STEEL

There has been no appreciable change in conditions in the foundry trades, full employment in engineering establishments contrasting with slackness at the light foundries. Demand for high-phosphorus grades of pig-iron does not increase, and, though supplies are abundant, the Control seems to be issuing licences less freely, probably prompted by the desire to ease the calls for railway transport. Production of low- and medium-phosphorus grades as well as refined iron has now overtaken the demand, and only hematite iron is really scarce, the determining factor in this instance being the lack of the necessary tonnages of suitable ores. As freight carrying capacity is steadily increasing, hopes are entertained that bigger tonnages of hematite ore may be imported, but realisation of these hopes may have to be deferred until after the new offensives have been successfully launched.

A quite recent improvement in rail facilities has put the deliveries of home-produced steel semis back to normal, and although there is still a very steady call for defectives as well as prime billets, there is not the same intensive demand for sheet bars. All classes of re-rolled products are very heavily booked, light and medium standard sections, small bars, sheets and wire being the more conspicuous features of this branch of the industry.

There are also clear indications that throughout the ensuing six months, at least, there will be no relaxation of the strain imposed on the plate mills by the swollen requirements of the shipbuilding, engineering and boiler-making trades. Orders for heavy joists and sections are mostly limited to small lots, but big outputs of steel rails, colliery arches, roofing bars, props, etc., reflect the high activity of the railways and the mines. Generally, the reduction of the back-logs reflects an improvement in the supply position, and the prospects are that arrears of deliveries at the end of the first period will be much below the average.

NON-FERROUS METALS

In reply to a question in the House of Commons recently, it was stated on behalf of the Minister of Supply that the proportion of our copper supplies drawn from the British Empire during 1943 was just over 60 per cent. It was estimated that more than 70 per cent. would be supplied by Empire sources during 1944. This increased percentage is partly accounted for by the withdrawal of United States Lease/Lend shipments to this country, but the fact remains that Rhodesian output will be cut by 25 per cent. as from April next. There are no further reports of any fresh curtailment of production, although it seems probable that the United States Government are contemplating a reduction in the amount of copper which is imported from South American countries. These imports are said to be on a very large scale, with a high price being paid, but no official announcement of policy regarding these has yet been made.

Tin supplies appear to be adequate to meet present demands, but there is little chance of accumulating any substantial reserves of this metal while the Japanese remain in control of the producing areas in Malaya and the Dutch East Indies. A statement that tin was to come off the list of critical metals in America has been strongly denied by the War Production Board.

Lead and zinc are available in sufficient quantities to meet the requirements of munitions production. A limited amount of zinc is being released for the galvanising of building materials, but apart from this there have been no civilian concessions made by the Control.

NEW PATENTS

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each.

558,382 BIRMINGHAM ELECTRIC FURNACES, LIMITED, and ROBIETTE, A. G. E. Electric induction furnaces.

558,390 BIRMINGHAM ELECTRIC FURNACES, LIMITED, and ROBIETTE, A. G. E. Manufacture or production of articles from powdered material.

558,400 THORNHILL, R. H., and MOPPETT, R. G. Gas-producers.

558,414 SIMMONDS, O. E. Self-locking nut.

558,419 BUDD MANUFACTURING COMPANY, E. G. Applying metallic skins to metal framework.

558,422 STURTEVANT ENGINEERING COMPANY, LIMITED, and STEDMAN, N. S. Induced draft fans and the cleaning of dust laden air or gas.

558,425 MAGNESIUM ELEKTRON, LIMITED, and BUSHROD, C. J. Processes for the protection of magnesium and magnesium base alloys against corrosion.

558,451 BRITISH ROPEWAY ENGINEERING COMPANY, LIMITED, and SHIELDS, H. F. H. Apparatus for loading wheeled vehicles and stocking-out material unloaded therefrom.

558,495 AJAX MANUFACTURING COMPANY. Wire drawing machines.

558,499 LANCASHIRE DYNAMO & CRYTPO, LIMITED, and WILSON, E. P. Apparatus for transporting, lifting and discharging loads.

558,506 SINCLAIR, J. M., and YOUNG, W. F. Electric flash welding.

558,508 WARING, F. E. Apparatus for the cutting and working of sheet metal and other rigid sheet materials.

558,558 WILLIAMS, W. P. (Armco International Corporation). Decarburising of steel containing silicon.

558,596 WALKER, W. S., and BRIDGE, J. F. Apparatus for casting metal ingots.

558,627 BIRMINGHAM ALUMINIUM CASTING (1903) COMPANY, LIMITED, and PRITCHARD, P. Metal cores for casting hollow metal articles.